November 11, 2010

Board of Public Works
City of Menasha
Menasha, WI 54952

RE: Traffic Study Report – Broad Street and Appleton Street

Members of the Board:

The Board of Public Works directed that a traffic study be made for determining the need for a change in traffic control signage at the intersection of Broad Street and Appleton Street.

Attached to this letter is a copy of the Engineering Department's Traffic Study. The Traffic Study provides information relating to traffic volume and speed, accident history and Manual on Uniform Traffic Control Devices (MUTCD) warrants for installation of regulatory signs.

In reviewing the information and from observations at the intersection, a warrant has been met to change the existing two-way stop regulatory signs to a three-way stop application at the intersection. Even though this warrant has been satisfied, it does not point to a safety issue at the intersection. In fact, the number and type of accidents at the intersection do not warrant any change to be made. There have not been requests made previously for a traffic regulatory change because of safety. It is our recommendation that a change be made to the existing traffic regulatory devices only if the intent is to address the existing sight distance issues. Otherwise, the existing two-way stop regulatory signs should remain.

Sincerely,

Tim J. Montour
Engineering Supervisor

Attachments

C: Street file

Traffic Study – Broad Street and Appleton Street

Reason for Study

Due to sight distance and safety concerns brought forth as part of the Traffic Study involving the possible conversion of the one-way section of Broad Street to two-way traffic, a request was made to study the feasibility of a three-way stop sign to be placed at the intersection of Broad Street and Appleton Street.

Physical Conditions

Broad Street is 37' back of curb to back of curb considered to be a local street. The 500 and 600 block of Broad Street is one-way traffic to the east. The street has a bituminous concrete surface with concrete curb and gutter. There are five foot wide concrete sidewalks on both sides of the street. The road right of way width is 77' to 80'+/- and the area is single and multi-family residential with an auto repair business and two restaurant/taverns located at the intersection of Broad and Appleton Streets. Parking is allowed on both sides of Broad Street with angle parking in front of 540 and 546 Broad Street.

Appleton Street is 33' back of curb to back of curb south of Broad Street and 41' back of curb to back of curb north of Broad Street and is considered to be a local street. The road right of way width is 65'+/- on both sides of Broad Street. There are five foot wide concrete sidewalks located on both sides of the street. The two restaurants/taverns are located on the northwest and northeast corners of the intersection respectively. There is angle parking on the east and west side of the street north of the intersection in the direct vicinity of the businesses. North of the businesses on Appleton there is parallel parking on both sides of the street. On Appleton Street south of Broad Street there is parallel parking in the basically residential area.

Currently, there is a two way stop on Appleton Street northbound and southbound.

Criteria Used from MUTCD

Section 2B.05 STOP Sign Applications

Guidance:

STOP signs should be used if engineering judgment indicates that one or more of the following conditions exist:

A. Intersection of a less important road with a main road where application of the normal right-of-way rule would not be expected to provide reasonable compliance with the law; **(Not applicable – existing two-way stop)**

B. Street entering a through highway or street; **(Warrant not satisfied)**

C. Unsignalized intersection in a signalized area; and/or **(Not applicable)**

D. High speeds, restricted view, or crash records indicate a need for control by the STOP sign. **(Warrant satisfied – see Guidance and attached drawing)**

Standard:

Because the potential for conflicting commands could create driver confusion, STOP signs shall not be installed at intersections where traffic control signals are installed and operating except as noted in Section 4D.01.

Portable or part-time STOP signs shall not be used except for emergency and temporary traffic control zone purposes.

Guidance:

STOP signs should not be used for speed control.

STOP signs should be installed in a manner that minimizes the numbers of vehicles having to stop. At intersections where a full stop is not necessary at all times, consideration should be given to using less restrictive measures such as YIELD signs (see Section 2B.08).

Once the decision has been made to install two-way stop control, the decision regarding the appropriate street to stop should be based on engineering judgment. In most cases, the street carrying the lowest volume of traffic should be stopped.

A STOP sign should not be installed on the major street unless justified by a traffic engineering study.

Support:

The following are considerations that might influence the decision regarding the appropriate street upon which to install a STOP sign where two streets with relatively equal volumes and/or characteristics intersect:

A. Stopping the direction that conflicts the most with established pedestrian crossing activity or school walking routes;
B. Stopping the direction that has obscured vision, dips, or bumps that already require drivers to use lower operating speeds;
C. Stopping the direction that has the longest distance of uninterrupted flow approaching the intersection; and
D. Stopping the direction that has the best sight distance to conflicting traffic.
The use of the STOP sign at highway-railroad grade crossings is described in Section 8B.08. The use of the STOP sign at highway-light rail transit grade crossings is described in Section 10C.04.

Section 2B.07 Multi-Way Stop Applications

Support:
01 Multi-way stop control can be useful as a safety measure at intersections if certain traffic conditions exist. Safety concerns associated with multi-way stops include pedestrians, bicyclists, and all road users expecting other road users to stop. Multi-way stop control is used where the volume of traffic on the intersecting roads is approximately equal.
02 The restrictions on the use of STOP signs described in Section 2B.05 also apply to multi-way stop applications.
Guidance:
03 The decision to install multi-way stop control should be based on an engineering study.
04 The following criteria should be considered in the engineering study for a multi-way STOP sign installation:
A. Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal. **(Not applicable)**
B. Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions. **(Warrant not satisfied – see attached accident reports)**
C. Minimum volumes:
1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and
2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but
3. If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2. **(Warrant not satisfied – see attached information)**
D. Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.
Option:
05 Other criteria that may be considered in an engineering study include:
A. The need to control left-turn conflicts; **(Warrant not satisfied)**
B. The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes; **(Warrant not satisfied)**
C. Locations where a road user, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless conflicting cross traffic is also required to stop; and **(Warrant satisfied – see attached drawing)**
D. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where multi-way stop control would improve traffic operational characteristics of the intersection. **(Warrant satisfied – see attached drawing)**

Traffic Count

Traffic counts were taken on Appleton Street (Broad Street to First Street) from Monday, November 8, 2010 to Thursday, November 11, 2010. There was an average of 515 vehicles per day for traffic in both directions. The traffic count for Broad Street was performed by the Police Department radar trailer (see attached). The breakdown of the speed is included in the attached report. The average number of vehicles per day travelling eastbound on Broad Street was 2491.

Accident History

There have been twelve (12) accidents (see attached) at the intersection of Broad Street and Appleton Street since 1994. There were no right angle accidents at the intersection. Four (4) of the more recent accidents involved a vehicle making a left turn out of the right lane.

Observations

The amount of vehicular traffic from the south side of Broad Street northbound on Appleton Street is minimal, but to try and cross Broad Street from the south can be difficult when traffic is heavy and there are numerous vehicles parked on Broad Street to the west of Appleton Street. A left turn movement to proceed eastbound on Broad Street from the north can be difficult when vehicles are parked in the angle parking area of Broad Street. To further complicate the sight triangle issue, eastbound cars can be pretty much anywhere in the street due to the one-way movement. Drivers need to be aware of eastbound traffic within all areas of the street not just the typical travel lane. The accident history and the fact that there have been no "right angle" type accidents, lead me to believe that people are aware of the sight problems at certain times of the day and night and enter the intersection with more cautious maneuvers than at a typical intersection.

Recommendations

Accident history does not warrant any change in the existing traffic regulatory devices. In fact, changing the existing regulatory signs from a two-way stop to three-way stop may cause confusion from the existing configuration and lead to more right angle crashes. Previously, the driver entering the intersection used extreme caution and managed entering the intersection with minimal accidents. Now a vehicle may enter the intersection off of Appleton Street making the assumption that an eastbound vehicle on Broad Street will stop. If that eastbound vehicle is used to the two-way stop, there may be more risk of a right angle accident. If accident history is the factor to determine the change, then a change to the existing traffic regulatory devices should not be made. It is not warranted and it does not appear to be a major concern of the motoring public, as there has not been a request made previously. Speed does not appear to be an issue and traffic regulatory devices should not be used for speed control. Also pointed out is the fact that stop signs should be installed in such a manner to minimize the number of vehicles that have to stop. As the Traffic Study points out, the restricted view and conflicting traffic warrants for a Multiway Stop Application from the MUTCD have been satisfied at this intersection. Restricted view should be considered due to the configuration of the street and businesses with the existing street parking for the businesses. To accommodate the recommended sight triangles needed for the two-way stop sign applications (see attached), you would need to eliminate the existing angle parking on the north side of Broad Street in front of 540 and 546 Broad as well as one (1) parallel parking stall directly west of the angle parking (see attached). On the south side of Broad Street west of Appleton Street you would need to eliminate approximately eight (8) parallel parking stalls (see attached). There are also two large terrace trees on the south side of Broad Street that are within the sight triangle. To eliminate that amount of parking in the area of the three businesses would have an adverse affect on how they do business. If the intent is to eliminate the existing sight distance problems with the intersection, it would be in the best interest of the City to change the existing intersection from a two-way stop intersection to a three-way stop intersection (see attached "Case E – Intersections with All-Way Stop Control"). This Department would recommend a new stop sign to be placed on both the northwest and southwest corner of the intersection for the eastbound traffic. In addition to the two new stop signs, we recommend to place two "Stop Ahead" signs on the existing utility poles approximately 130 feet west of the intersection for the eastbound traffic. We recommend that each of these four new signs have an orange traffic flag affixed to them to draw attention to the new configuration.

Tim Montour

From: Matthew Albrecht
Sent: Wednesday, November 10, 2010 7:19 PM
To: Tim Montour
Subject: RE: Broad Street Radar Trailer Info

Tim,

Here are the results from the most recent survey.

The survey occurred from 11-07-2010 @ 9:55pm to 11-10-2010 @ 5:00pm.

Total Vehicles: 6977
Average Speed: 23.01 MPH
50% of the vehicles were traveling 23 MPH or slower
85% of the vehicles were traveling 27 MPH or slower

1 vehicle was traveling 42 MPH
1 vehicle was traveling 39 MPH
1 vehicle was traveling 38 MPH
6 vehicles were traveling 35 MPH

The remaining vehicles were traveling 34MPH or slower.

If you need any more data or information please let me know.

Thanks,

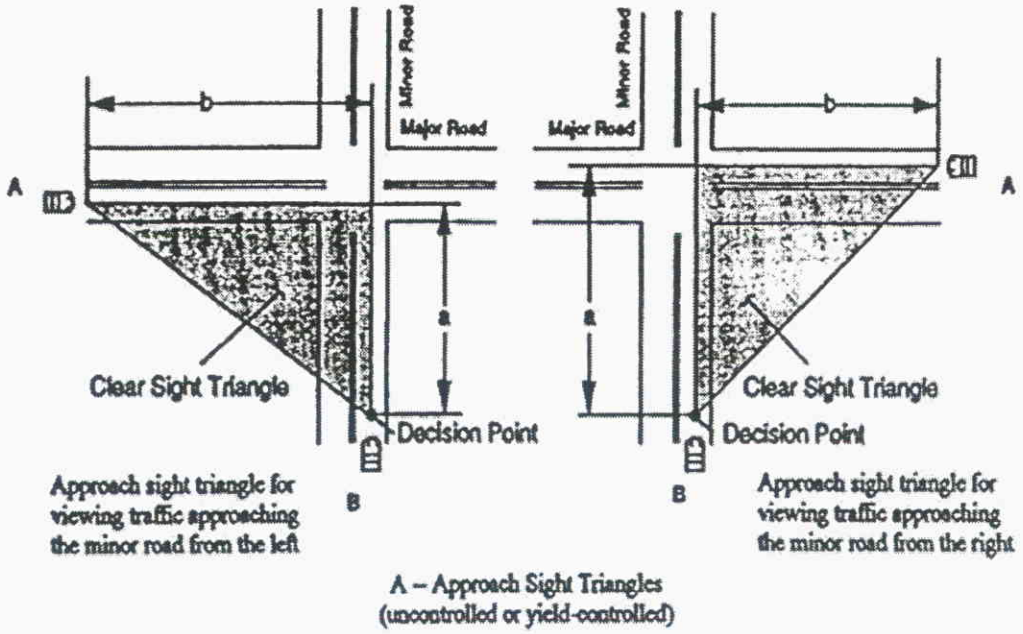
Matthew Albrecht
Patrol Officer
City of Menasha Police Department
430 First Street
Menasha, WI 54952
Phone: 920-967-3500
Voicemail: 920-967-3573
Fax: 920-967-5145

From: Tim Montour
Sent: Monday, November 08, 2010 2:23 PM
To: Matthew Albrecht
Cc: Mark Radtke
Subject: RE: Broad Street Radar Trailer Info

Good afternoon

I will rely on your expertise. You are correct; we are looking for the most accurate numbers for the 500 block. Thanks for your help.

Tim



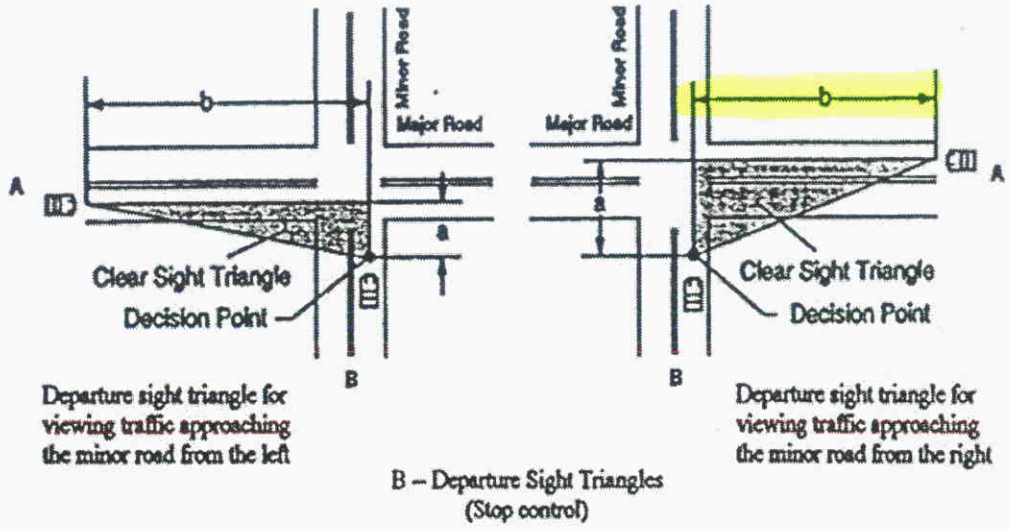


Exhibit 9-50. Intersection Sight Triangles

Metric				US Customary			
		Intersection sight distance for passenger cars				Intersection sight distance for passenger cars	
Design speed (km/h)	Stopping sight distance (m)	Calculated (m)	Design (m)	Design speed (mph)	Stopping sight distance (ft)	Calculated (ft)	Design (ft)
20	20	41.7	45	15	80	165.4	170
30	35	62.6	65	20	115	220.5	225
40	50	83.4	85	25	155	275.6	280
50	65	104.3	105	30	200	330.8	335
60	85	125.1	130	35	250	385.9	390
70	105	146.0	150	40	305	441.0	445
80	130	166.8	170	45	360	496.1	500
90	160	187.7	190	50	425	551.3	555
100	185	208.5	210	55	495	606.4	610
110	220	229.4	230	60	570	661.5	665
120	250	250.2	255	65	645	716.6	720
130	285	271.1	275	70	730	771.8	775
				75	820	826.9	830
				80	910	882.0	885

Note: Intersection sight distance shown is for a stopped passenger car to turn left onto a two-lane highway with no median and grades 3 percent or less. For other conditions, the time gap must be adjusted and required sight distance recalculated.

Exhibit 9-55. Design Intersection Sight Distance—Case B1—Left Turn from Stop

Sight distance design for left turns at divided-highway intersections should consider multiple design vehicles and median width. If the design vehicle used to determine sight distance for a divided-highway intersection is larger than a passenger car, then sight distance for left turns will need to be checked for that selected design vehicle and for smaller design vehicles as well. If the divided-highway median is wide enough to store the design vehicle with a clearance to the through lanes of approximately 1 m [3 ft] at both ends of the vehicle, no separate analysis for the departure sight triangle for left turns is needed on the minor-road approach for the near roadway to the left. In most cases, the departure sight triangle for right turns (Case B2) will provide sufficient sight distance for a passenger car to cross the near roadway to reach the median. Possible exceptions are addressed in the discussion of Case B3.

If the design vehicle can be stored in the median with adequate clearance to the through lanes, a departure sight triangle to the right for left turns should be provided for that design vehicle turning left from the median roadway. Where the median is not wide enough to store the design vehicle, a departure sight triangle should be provided for that design vehicle to turn left from the minor-road approach.

The median width should be considered in determining the number of lanes to be crossed. The median width should be converted to equivalent lanes. For example, a 7.2-m [24-ft] median should be considered as two additional lanes to be crossed in applying the multilane highway adjustment for time gaps in Exhibit 9-54. Furthermore, a departure sight triangle for left turns

However, if the traffic signal is to be placed on two-way flashing operation (i.e., flashing yellow on the major-road approaches and flashing red on the minor-road approaches) under off-peak or nighttime conditions, then the appropriate departure sight triangles for Case B, both to the left and to the right, should be provided for the minor-road approaches. In addition, if right turns on a red signal are to be permitted from any approach, then the appropriate departure sight triangle to the left for Case B2 should be provided to accommodate right turns from that approach.

Case E—Intersections with All-Way Stop Control

At intersections with all-way stop control, the first stopped vehicle on one approach should be visible to the drivers of the first stopped vehicles on each of the other approaches. There are no other sight distance criteria applicable to intersections with all-way stop control and, indeed, all-way stop control may be the best option at a limited number of intersections where sight distance for other control types cannot be attained.

Case F—Left Turns from the Major Road

All locations along a major highway from which vehicles are permitted to turn left across opposing traffic, including intersections and driveways, should have sufficient sight distance to accommodate the left-turn maneuver. Left-turning drivers need sufficient sight distance to decide when it is safe to turn left across the lane(s) used by opposing traffic. Sight distance design should be based on a left turn by a stopped vehicle, since a vehicle that turns left without stopping would need less sight distance. The sight distance along the major road to accommodate left turns is the distance traversed at the design speed of the major-road in the travel time for the design vehicle given in Exhibit 9-66.

Design vehicle	Time gap (t_g) (seconds) at design speed of major road
Passenger car	5.5
Single-unit truck	6.5
Combination truck	7.5

Adjustment for multilane highways:

For left-turning vehicles that cross more than one opposing lane, add 0.5 seconds for passenger cars and 0.7 seconds for trucks for each additional lane to be crossed.

Exhibit 9-66. Time Gap for Case F—Left Turns from the Major Road

The table also contains appropriate adjustment factors for the number of major-road lanes to be crossed by the turning vehicle. The unadjusted time gap in Exhibit 9-66 for passenger cars was used to develop the sight distances in Exhibit 9-67 and illustrated in Exhibit 9-68.

ACCIDENT SUMMARY SHEET

ROUTE: *Broad St.* **LOCATION:** *at Appleton St.*

MUNICIPALITY: *Menasha* **COUNTY:** *Winnebago*

TIME PERIOD COVERED: - **REFERENCE MARKERS / NODES:** -

REMARKS: *All Accidents* **DATE:** *11/2/2010*

TIME OF DAY	# ACC	%
6 AM - 10 AM	1	7.7%
10 AM - 4 PM	8	61.5%
4 PM - 7 PM	1	7.7%
7 PM - 12 AM	2	15.4%
12 AM - 6 AM	0	0.0%
Unspecified	1	7.7%
Total	**13**	

DIRECTION	# ACC	%
North	4	16.7%
South	2	8.3%
East	14	58.3%
West	1	4.2%
Total	**24**	

DIRECTION	# ACC	%
Northeast	2	8.3%
Northwest	1	4.2%
Southeast	0	0.0%
Southwest	0	0.0%
Unspecified	0	0.0%

WEATHER	# ACC	%
Clear	4	30.8%
Cloudy	5	38.5%
Rain	1	7.7%
Snow	0	0.0%
Sleet/Hail/Freezing Rain	0	0.0%
Fog/Smog/Smoke	0	0.0%
Unspecified	3	23.1%
Total	**13**	

ACCIDENT TYPE	# ACC	%
Rear End	1	7.7%
Overtake	2	15.4%
Right Angle	0	0.0%
Left Turn	4	30.8%
Right Turn	0	0.0%
Fixed Object	0	0.0%
Head On	0	0.0%
Sideswipe	1	7.7%
Total	**13**	

ACCIDENT TYPE	# ACC	%
Pedestrian	0	0.0%
Bicycle	0	0.0%
Parked Vehicle	1	7.7%
Backing	1	7.7%
Run Off The Road	0	0.0%
Animal	0	0.0%
Other	2	15.4%
Unspecified	1	7.7%

SURFACE	# ACC	%
Dry	8	61.5%
Wet	1	7.7%
Mud/Slush	1	7.7%
Snow/Ice	0	0.0%
Unspecified	3	23.1%
Total	**13**	

ACCIDENT SEVERITY	# ACC	%
Fatal	0	0.0%
Injury	0	0.0%
Property Damage	10	76.9%
Non-Reportable	2	15.4%
Total	**13**	

TIME OF YEAR	# ACC	%
Winter (Dec-Feb)	2	16.7%
Spring (Mar-May)	3	25.0%
Summer (Jun-Aug)	4	33.3%
Fall (Sep-Nov)	3	25.0%
Total	**12**	

TYPE OF VEHICLE	# ACC	%
Passenger Cars	13	100.0%
Commercial Vehicles	0	0.0%
Total	**13**	

DAY OF WEEK	# ACC	%
Sunday	2	15.4%
Monday	1	7.7%
Tuesday	1	7.7%
Wednesday	0	0.0%
Thursday	3	23.1%
Friday	5	38.5%
Saturday	1	7.7%
Total	**13**	

LIGHT CONDITION	# ACC	%
Daylight	6	46.2%
Dawn/Dusk	0	0.0%
Night	1	7.7%
Unspecified	6	46.2%
Total	**13**	

SUMMARY OF ACCIDENT SEVERITY BY YEAR: **0**

Fatal Accidents	0
Injury Accidents	0
Property Damage Accidents	0
Non-Reportable Accidents	0
Total Accidents	**0**

DETAILS OF ACCIDENT HISTORY

PERIOD STUDIED:
FROM:
TO:
0 MONTHS

ROUTE NUMBER/STREET NAME: *Broad St.*
LOCATION *at Appleton St.*
MUNICIPALITY: *Menasha* COUNTY: *Winnebago*
REFERENCE MARKERS / NODES: -

CASE No.
FILE: *broad_appleton*
BY: *cr*
DATE: *11/2/2010*

No.	DATE	TIME	# VEHICLES	SEVERITY	LIGHT COND	ROAD CHAR	SURFACE	WEATHER	CONTRIB. FACTORS	ACC. TYPE	ACCIDENT DESCRIPTION	KEY #
9												
1	6/24/1994	14:00		PDO			1	2		LTRN		
2	8/4/1996	22:25		PDO			1	1		OTH		
3	12/12/1996	11:46		PDO			5	2		OTH		
4	1/30/1998	17:02		PDO			1	2		LTRN		
5	5/16/1999	15:13		PDO			1	2		OVTK		
6	10/18/2002	12:10	2	N/R	1	1			3	Park	unit 2 was angle parked, unit 1 backed into left side of unit 2	
7	7/15/2003	15:31	1	N/R	1	1			4	Rend	unit 2 slowed rapidly for traffic, unit 1 rear ended unit 2	
8	4/25/2005	21:10	2	PDO	4	1	2	3	3	Back	unit 1 backing out of driveway, struck legally parked unit 2	
10	5/14/2009	7:20	2	PDO	1	1	1	2	18	Ltrn	veh 1 turned left from right lane in front of veh 2	
12	9/11/2009	14:42	2	PDO	1	1	1	1	18	Ltrn	veh 1 made left turn from right lane, struck veh 2 in left lane	
11	9/11/2009	14:42	2	PDO	1	1	1	1	18	Ovtk	unit 1 turn left nb from right lane into unit 2 eb-one way st	
13	8/5/2010	15:31	2	PDO	1	1	1	1	7 4 40	Side	veh 1 made left turn from right lane, struck veh 2 in left lane	

COLLISION DIAGRAM

Key Number =

MUNICIPALITY: Menasha COUNTY: Winnebago

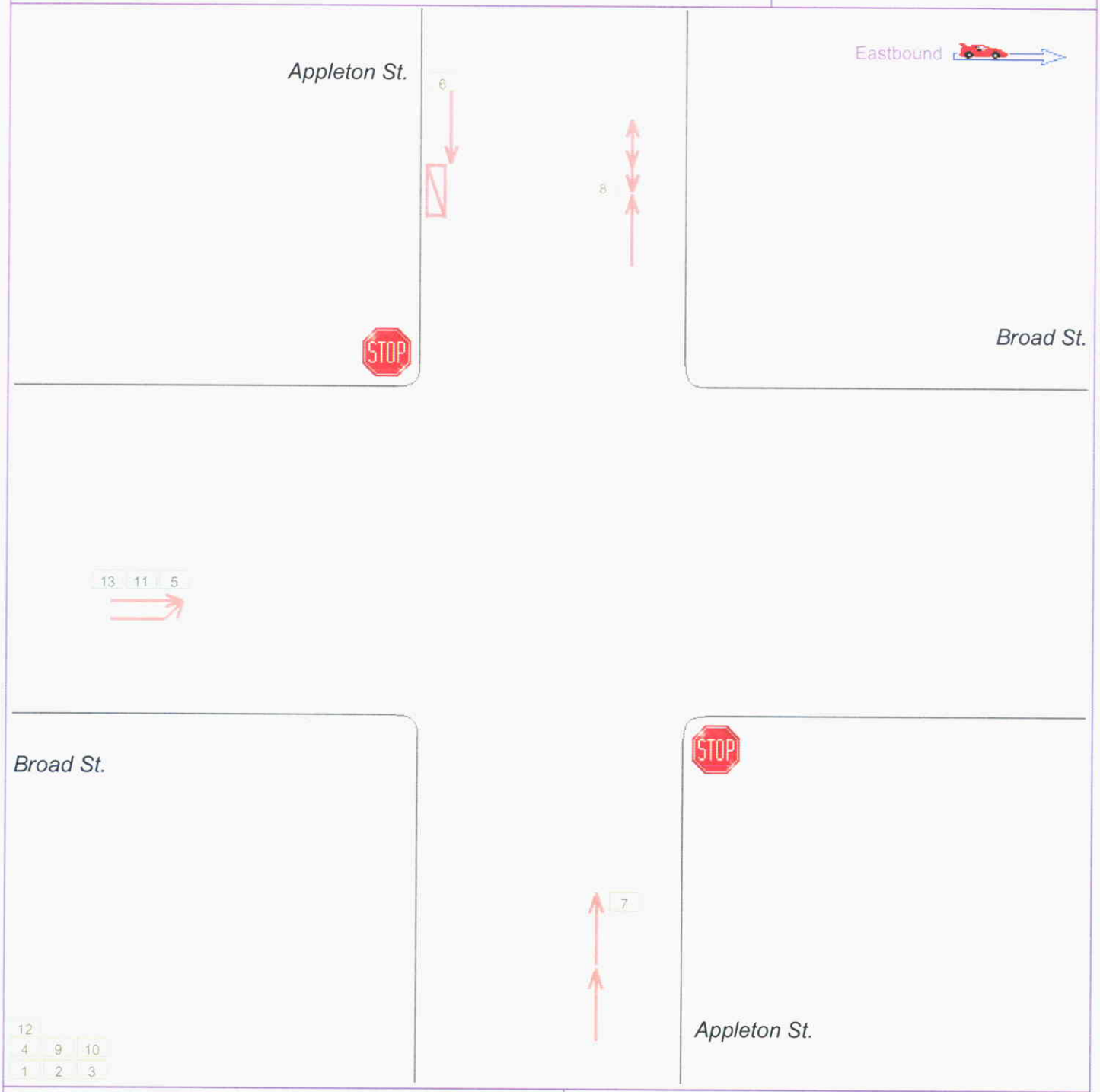
INTERSECTION: Broad St.

PERIOD: 0 YEARS 0 MONTHS FROM TO

FILE: broad_appleton

CASE # :

BY: cr DATE: 11/11/2010

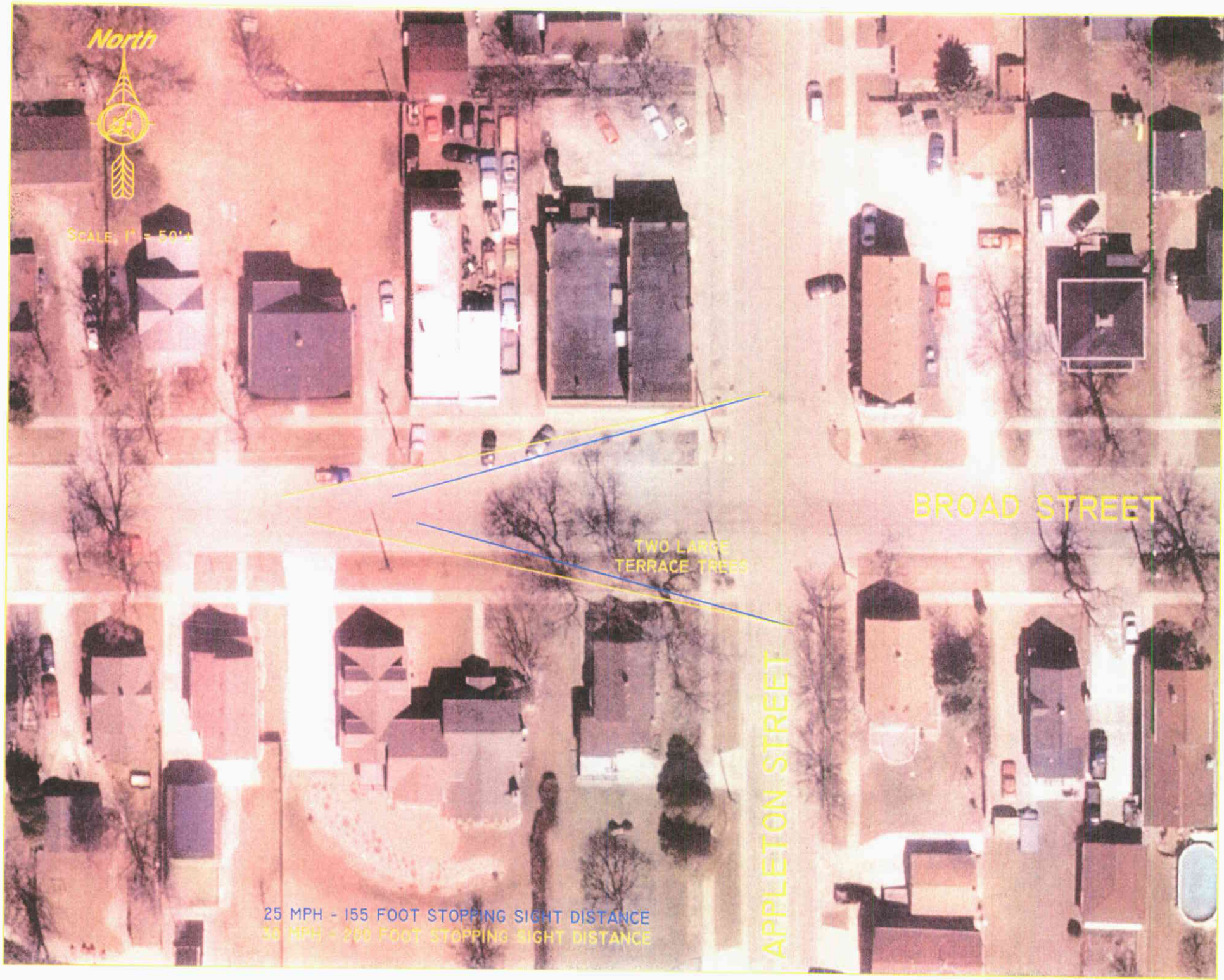


SYMBOLS

- MOVING VEHICLE
- TURNING VEHICLE
- BACKING VEHICLE
- PARKED VEHICLE
- 999 RECORD NUMBER
- P PEDESTRIAN
- B BICYCLIST
- A ANIMAL
- FIXED OBJECT
- Fatal

MANNER OF COLLISION

- REAR END
- LEFT TURN
- LEFT TURN
- OVERTAKE
- OUT OF CONTROL
- HEAD ON
- RIGHT TURN
- RIGHT TURN
- RIGHT ANGLE
- SIDE SWIPE



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